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ginning at the left, Chateaubelair island, strait and point, and the same repeated. The island in the middle of this illustration is composed of Chateaubelair point on the left and Chateaubelair island on the right.*

There are some statements in the article which would not have been made by the author had he spent more time in the study of the volcanoes which he was sent by the National Geographic Society to investigate as a scientist.

It seems to the writer that Mr. Borchgrevink should explain such very inaccurate statements as those cited regarding four important illustrations accompanying his article. These corrections are particularly important at the present time, because Mr. Borchgrevink is now trying to raise funds for another expedition to the Antarctic regions and the public should be satisfied as to the scientific accuracy of one who desires to undertake such enterprises.

The writer feels qualified to make the preceding criticisms because he spent nearly seven weeks on Martinique and St. Vincent studying the phenomena of these eruptions.

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PATAGONIAN GEOLOGY.

IN a recent publication,† F. Ameghino gives again a new table of the geological succession of the different Cretaceous and Tertiary beds found in Argentina. This scheme differs from those published by him previously in several respects, but, as in all his former publications, he fails to give any evidence whatever for the succession of the respective beds, and thus this new scheme has only the same negative value as all the previous ones.

Moreover, in some respects, the present scheme is entirely opposed to some of the ob-

servations made by J. B. Hatcher* in southern Patagonia, and the results obtained by the present writer in studying the Tertiary invertebrates collected by Hatcher.†

This discrepancy is most evident in Ameghino's conception of the so-called Patagonian formation, which is regarded by Hatcher and the present writer as a geological and paleontological unit of marine beds, while Ameghino divides it into no less than six marine horizons, which, in part, correspond to four continental horizons.

The general trend of our demonstration that Ameghino's divisions are untenable, is that the so-called characteristic fossils of the latter do not actually characterize them, but are found associated in the same layers.

It may be said that the fact that some of the characteristic fossils are found in more than one of Ameghino's horizons does not alter the general character of difference of the various faunas. But I wish to emphasize here that I have shown this not for *some* or a *few* of the 'characteristic' species, but for *practically all of them*. The few exceptions are formed by comparatively rare species which are altogether unfit to be used for the discrimination of horizons (see Ortmann, *l. c.*, p. 284).

But it is not only the lack of all evidence for his views that we have to complain of in Ameghino's paper, but it is the way in which he treats some of the deposits that have been closely investigated by us, by adding to and taking away from the evidence given by us.

I shall mention only the most striking instances.

The Cape Fairweather beds are placed by Ameghino, in his table, in the Lower Pliocene, between the Lower Tehuelche and the Ensenadense beds. He says of the fauna of these deposits that it contains 50 per cent. extinct mollusks, and gives the following characteristic fossils: *Ostrea ferrarisi*, *Chlamys* (*Pecten*) *actinodes*, *Turritella innotabilis*, *Trophon inornatus*, etc.

* See *Amer. Jour. Sci.*, vol. 4, 1897, pp. 327-354, and *ibid.*, vol. 9, 1900, pp. 85-108.

† 'Rep. Princeton Univers. Exped. Patagonia,' vol. 4, part 2, 1902.

* Compare this picture with the second one on page 790 of September *Century Magazine*.

† Ameghino, F., 'Cuadro Sinóptico de las formaciones sedimentarias, Terciarias y Cretáceas de la Argentina en relacion con el desarrollo y descendencia de los Mamíferos,' *Anales del Mus. Nac. de Buenos Aires*, vol. 8, 1902, pp. 1-12.

The facts concerning these beds, which were discovered by Hatcher, and the fauna of which was studied by Pilsbry (*Proc. Acad. Philad.*, 1897) and the present writer, are as follows (see Ortmann, *l. c.*, p. 307 f.):

The Cape Fairweather beds are supposed to be Pliocene. They lie uncomformably on top of the Santacruzian beds (Miocene according to Hatcher, Eocene according to Ameghino). This is all that is known of their stratigraphy. They contain a fauna of fourteen species, among which *Ostrea ferrarisi* is not found, and of which 57 per cent. are recent.* The most characteristic (and abundant) species are *Pecten actinodes*, of Ameghino's list; but, besides, several others must be mentioned, namely, *Terebratella gigantea*,† *Meretrix rostrata*, *Galerus mamillaris* and *Trophon laciniatus* (the variety *inornatus* of the latter is comparatively rare). *Ostrea ingens*, although very abundant, is not characteristic.

Aside from the incompleteness and incorrectness of the paleontological characters as given by Ameghino, how is it at all possible to place these beds where he does within his scheme? What does Ameghino know about the relation of the Cape Fairweather beds to the Lower Tehuelche and the Ensenadense beds? Does he possess any evidence on this point beyond that furnished by Hatcher? These are questions to which an answer is requested, and, unless Ameghino gives satisfactory explanation, we cannot put any faith in his stratigraphic reference of the Cape Fairweather beds.

A second instance is Ameghino's treatment of the 'Arenense' formation. This he puts into the Upper Eocene, on top of the 'Superpatagoniense,' and below the Oligocene 'Para-

* This percentage is of no value at all on account of the small number of species.

† This very characteristic form described by myself for the first time from Cape Fairweather, which, consequently, is its type locality and formation, is removed by Ameghino from its association with the other 'Fairweatherense' fossils, and mentioned as characteristic for the horizon below, the 'Lower Tehuelche.' There is no excuse whatever for this arbitrary change of facts, and this course cannot be too strongly condemned.

nense,' and mentions seven characteristic fossils.

This formation, no doubt, has been created to receive the uppermost marine horizon discovered by Hatcher near Punta Arenas, from which I have described seven species; but the latter do not correspond to those mentioned by Ameghino. Five of the species of my list are also found at the type locality of the Patagonian beds at Santa Cruz (see Ortmann, *l. c.*, p. 280), and, consequently, I have drawn the conclusion that these beds are contemporaneous. Of these five species, not a single one has been mentioned by Ameghino by name, and only three *de facto*, but under different names (*Ostrea ingens* as *O. philippi*, *Crepidula gregaria* as *C. imperforata*, and *Sigapatella americana* as *Trochita colchaguensis*). The other two (*Glycimeris ibari* and *Lucina promaucana*) have been left out entirely, and further, *Venus chiloensis* is not mentioned, and *Meretrix iheringi* is removed into the horizon below (as *Cytherea splendida*). In their place, Ameghino adds four other species: *Cardium magellanicum*, *Modiola schythei*, *Venus rodriguezi*, and *Psammobia darwini*. These are taken from Philippi's list of fossils found near Punta Arenas:* some of the species of this list have been rediscovered by Hatcher, but they are found in different horizons here, partly above, and partly below the Punta Arenas coal. Thus it is impossible to say of any of the other species that have not been collected by Hatcher, whether they belong to the 'Arenense' beds, or to the 'Magellanian,' by which name we have called the beds below the coal. And further, why does Ameghino select only these four species out of Philippi's list, while there are four more which are entitled to the same consideration?

These two instances may be sufficient. I shall not discuss the age assigned to the respective beds by Ameghino, although Stanton† and myself have devoted much time and labor to this question, and our final results are at

* Philippi, R. A., 'Die tertiaeren und quartaeren Versteinerungen Chiles,' 1887, p. 251.

† 'Rep. Princeton Univers. Exped. Patagonia,' Vol. 4, Part 1, 1901.

variance with Ameghino's. When he places the marine Cretaceous beds of the lower Rio Tarde section in the Neocomian, while Stanton declares them not older than Gault, and when he places the marine Patagonian beds in the Eocene, while I assign them to the Lower Miocene, he can do so only if he introduces new evidence, and shows that our determinations are incorrect. But he has not done this, and has never attempted to do it, and therefore his personal opinion on this question is without any scientific value.

Ameghino may claim that my final report on the Tertiary invertebrates had not come into his hands when he wrote the present paper. But he must have seen Stanton's report, as well as the preliminary notes by Hatcher and myself in the *American Journal of Science*. These should have induced him to wait for the publication of my final report.

DR. A. E. ORTMANN.

PRINCETON UNIVERSITY,
September, 1902.

VELOCITY OF LIGHT IN AN ELECTROSTATIC FIELD.

TO THE EDITOR OF SCIENCE: In a paper, 'Determination of the Electric and Magnetic Quantities,' *Phys. Rev.*, January, 1900, I pointed out that light should be accelerated in an electrostatic field. I have to announce that preliminary experiments made last year show that this is the case, though the velocity actually observed is only eighty per cent. of that predicted in the paper referred to.

The tests, however, were rough and can be made more accurately with improved apparatus. I am desirous of repeating them, and obtaining a closer result. I would be glad to know of any one who has worked on interference phenomena who would be willing to collaborate with me, I of course bearing all expense.

In a recent note to the Toronto Astronomical Society, I refer to a paper to be published in SCIENCE, in which I show that by a development of the vortex theory described in the above-mentioned paper, the difference between positive and negative electricity is explained. By some mishap this paper was lost in the

mails, about last December, and merely the letter forwarded with it reached the editor. I hope to rewrite it, but at present would say that I found that the difference is merely one of circulation, *i. e.*, that the simple vortex singularity must be taken as the negative electron, and that when a number of the vortex singularities are so grouped that their circulation is closed, they behave as positive electrons. Hence the positive electron is simply an agglomeration of negative electrons, so grouped as to have a closed circulation.

REGINALD A. FESSENDEN.

SHORTER ARTICLES.

THE FORMATION OF DEWBOWS.

If an observer standing on a mountain top should view below him, under suitable conditions, a horizontal stratum of falling raindrops on which the sun was shining, he would see a rainbow. This bow would appear as a true circle, or a segment of it, depending upon the area of the stratum and the position of the sun. If, however, he could view this bow with reference to its *space* relations, he would no longer see a circle, but some other conic section. This latter condition was recently observed to be satisfied by the reflection and refraction of sunlight in the drops of dew on a lawn. The phenomenon appears to be unique, and furnishes another interesting modification of the familiar rainbow.

The space in front of one of the Government buildings had been recently harrowed and then carefully leveled and rolled, and finally seeded thickly with Kentucky blue grass. At the time the observations were made this grass was about one and a half centimeters high, covering the ground thickly, and very uniform in height, the fine spears being surmounted with drops of dew.

On standing with one's back to the sun, one could see the bow on the grass very distinctly, which at nine o'clock A.M. was at a distance of about one meter at its nearest point, and then extended on either side in the form of a conic, to a distance of from ten to fifteen meters. The red color of the outer portion of the bow and the blue of the inner side were well de-